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RESEARCH AID

DEVELOPMENTS IN RAILROAD TRANSPORTATION IN COMMUNIST CHINA 1956-57

CIA/RR RA-34
23 June 1958

CENTRAL INTELLIGENCE AGENCY

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(ORR Project 43.2038)

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FOREWORD

The expanding economy of Communist China requires increasing railroad facilities. From the meager resources available in 1949, the Communists have expanded and developed a railroad system capable of relatively high performance. These achievements have previously been covered by a series of ORR reports; therefore, the question treated in this research aid is not "Could the Chinese Communist railroads achieve the performance levels which they have announced?" but, rather, "How did they do it?"

In the issue of the Soviet railroad magazine Zheleznodorozhnyy transport for October 1957 appeared 69 pages of articles by various top officials in the Ministry of Railroads of Communist China. These reports constitute the longest and most detailed authoritative discussion of Chinese Communist railroad operations ever to appear in open publications. This material contains considerable information hitherto unavailable which, with other data released recently, offers an answer to the question.

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DEVELOPMENTS IN RAILROAD TRANSPORTATION IN COMMUNIST CHINA* 1956-57

Summary

The Chinese Communists have had remarkable success in operating their railroads. They took over a faltering, war-ravaged system in 1949, had it almost fully repaired by 1952, and in the intervening years have established a series of new records for performance by the system. For the First Five Year Plan (1953-57) they established high goals in all phases of railroad activity and proceeded to overfulfill most of them. The fifth-year target for tons of freight originated was achieved in the fourth year. With a relatively small amount of equipment, the Chinese have maintained a very high level of efficiency in most phases of railroad operation -- in some cases among the best in the world.

In 1956 the Chinese Communist railroads performed 120.4 billion ton-kilometers (tkm)** of freight transport, much more than was done in any year before the Communists took over and 3 times what they were able to accomplish in 1950 (the first full year under their control). For the same year the Chinese Communists also announced a figure of 246 million tons originated, a quantity that far exceeded pre-Communist records and was 2.5 times the figure for 1950.

Available information reveals that the Chinese Communists have succeeded in loading cars to 92 percent of capacity on the average, in maintaining a turnaround time for freight cars of about 4 days, in obtaining about 525,000 tkm of work per locomotive day, and in increasing the average gross load per train from 1,084.5 tons in 1952 to 1,519.1 tons in 1956. The tonnages announced are adequate to support the current level of industrial development in China only because of the extremely small portion of the load which is consumer goods.

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* The estimates and conclusions contained in this research aid represent the best judgment of ORR as of 15 April 1958.
** Tonnages are given in metric tons throughout this research aid.

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I. Introduction.

Before the Communists took over China late in 1949, control of the railroads of that country was divided among several agencies including the Chinese government and, at various times, private owners, independent warlords, the USSR, and Japan. During that period, no unified report on rail operations for the nation was issued. After the Communists assumed power, they undertook to unify the industry. They have announced achievements so remarkable that non-Communist observers have hesitated to accept them, but analysis based on 8 years of observing these railroads and reviewing published information has indicated that the claims of the Chinese Communists are generally reliable.*

The Chinese Communists have achieved these results by effective planning (including raising the amount of freight carried by through trains to 22 percent of the total), by thorough exploitation of the plentiful supply of labor, and by the large-scale introduction of new, improved equipment.

II. Administrative Techniques Promoting Maximum Output.

A. Planning.

Because industrial input and output in Communist China are planned in advance on a nationwide scale, demands for rail traffic can be anticipated with a reasonable degree of accuracy, and rail operations can be coordinated. For the first time, all the Chinese railroads have been combined into one system -- a fact which further facilitates planning. Also, the demand for sustained rail service remains just about equivalent to the capacity of the rail system. This situation permits a continued and steady use of the full facilities of the system, results in maximum annual production per unit, and enables the government to force the users to adjust to some degree to a pattern of optimum performance by the railroads.**

In general, the planners strive for a rhythmic movement of traffic -- that is, having trains shuttle back and forth in response to an

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* For comments on inaccuracies, inconsistencies, and careless editing in Communist reports on Chinese Communist railroading, see Appendix B.

** An example of this is the directive approved 18 March 1957 by the State Council requiring the Ministry of the Coal Industry and the Ministry of Railroads to ship and transport more coal during the slack market season so that more time and planning could be applied to winter shipments. 1/ (For serially numbered source references, see Appendix E.) There is also more than a hint of this practice in the announcement that when there is an imbalance in two-way traffic, appropriate steps are to be taken to eliminate deadheading. 2/

appropriately regulated demand for freight transport. Furthermore, they make an effort to level off the peaks of demand and to keep the flow of traffic steady. One means of achieving this leveling is for the Ministry of Railroads to set up joint offices with some of the main shippers and thus facilitate cooperation in planning. The Chief of the Freight Operations Administration of the Ministry of Railroads has stated:

> The number of such offices rose to 115 in 1956 compared with 12 in 1950. The number of /yearly plan/ contracts negotiated with clients rose to 1,311 in 1956 compared with 360 in 1951 ... . To insure rhythmic fulfillment of the plan of shipments, agreements on uniform distribution of shipments are negotiated with clients. Use of such agreements began in 1954. By 1955, there were already 188 agreements ... . By 1956 the number of agreements had increased to 347, encompassing 66.9 percent of the total volume of planned shipments. 3/

The over-all plan for freight, when established, has ramifications through the organization because there are shipping plans, technical plans, and numerous kinds of operating plans for all echelons. The plans are divided into 5-year, annual, monthly, 10-day, 5-day, and daily plans. 4/ In 1955, when the smallest improvement in railroad freight traffic performance occurred, some aspects of the plan for rail shipments were found to be seriously out of line as a result of rather sharp changes in the national economy, and necessary corrections were made in the yearly plans with the permission of the government. 5/ This circumstance provides the first clue which the Chinese Communists have given as to reasons for comparatively poor railroad performance in 1955.

Planning is aided further by the relatively simple pattern of the Chinese Communist railroad system. With but very few main lines, very few major rail junctions, and a relatively small number of customers, successful planning for maximum use of the railroad facilities may be easier in Communist China than in any other major nation in the world.

B. Exploitation of Labor.

With nearly 15 times as many employees per mile of track as the US railroads had during a comparable period of steam operation,* the Chinese Communist railroads are free to use cheap manpower wherever this practice can save equipment and increase output per unit of rolling stock. Quantity of labor is not a major problem. The quality of labor,

* Chinese Communist figures for 1956 6/ and US figures for 1931. 7/

however, is more difficult to assess. Certainly in the years immediately after the Communists came to power, most of the labor available for the railroads lacked technical skill. For a few years a large number of Japanese railroad technicians, who had been captured in Manchuria, were exploited, but as soon as the Chinese personnel were able to take over, most of the Japanese were repatriated.

With the aid of Soviet advisers and the captured Japanese technicians, the Ch'ang-ch'un Railroad in Manchuria was raised to a high standard and then used as a model and practical training ground for railroad men from the rest of China. In 1954 and 1955, for example, over 1,300 supervisors from various echelons were sent from the Ministry and the railroad control bureaus to the Harbin Railroad Administration for intensive study of the advanced operating techniques on the Ch'ang-ch'un Railroad. 8/ Self-education, on-the-job training, apprenticeship, after-hours training, and courses in technical schools or railroad colleges are used to improve the skill of railroad personnel. 9/

The Chinese Communist leaders have adopted many devices for leading and driving the railroad workers. The Minister of Railroads has stated:

> Chinese railroad men are well aware of the tremendous importance of railroads in the development of the national economy, in strengthening the national defense, and in improving the life of the people ... . They are carrying out joyfully, with enthusiasm, and with a strong sense of responsibility the new and glorious task entrusted to them by the state. 10/

Stripped of its propagandistic verbiage, the Minister's statement does cover one important aspect of labor morale. The railroad workers are kept constantly aware of the importance of their work, and they are, in some ways, treated as a sort of labor elite. They have special hospitals and schools and have been provided with 4 million square meters of new housing and with clubhouses, sports facilities, and numerous other fringe benefits. 11/

At least as important as the morale-boosters, however, are the less cheerful incentives such as emulation competitions, accountability, norms, and economic pressures. The Chinese Communist railroad worker is faced with a succession of campaigns for greater production and more economy. Reportedly, the competition to attempt to achieve a productivity of 1 million tkm per locomotive per day "found an eager response among all railroad men." 12/ It is probably true that the response was energetic because the men have no real alternative. It is doubtful,

however, that the response by the workers was actually "eager," because every time they achieve such a goal, they find their daily work norms raised accordingly, with no raise in wages. In the Ch'i-ch'i-ha-erh Bureau, for example, 23,862 working norms were revised, and the allowed working time was reduced 15 percent on the average. 13/ At the car repair plant in Shih-chia-chuang, norms were reviewed for 23 trades, and the allowed working time was reduced by an average of 23.5 percent. 14/ Norms for consumption of material as well as norms for working time are decreased from year to year. As a result, operating costs have been reduced, and labor productivity has risen. 15/

Partly because of good morale and partly because of the practical incentives offered, the Chinese Communist railroad workers apparently have responded well to the continuing campaigns which solicit what the Communists call "rationalizing suggestions" for the improvement of efficiency and output. In the car economy alone, 10,727 rationalizing suggestions were accepted and put into effect during 1954-56. 16/ Among these the most outstanding successes are said to have been in the area of the invention and improvement of production devices and tools. In the railroad repair shops, personnel offered 49,434 suggestions, of which 27,550 were put into effect, with a resultant saving of 13,607,000 yuan.* 17/ Although not publicized, undoubtedly an accompanying reduction of time norms and an increase of production norms resulted for the workers.

In addition to the use of norms which must be met to earn the basic pay, bonuses for those who substantially exceed the norms, awards for making usable suggestions, and other more or less positive economic prods, the Communist administrators are anxious to be able to pinpoint blame and to provide punishment for all failures. Complete accountability is the goal. An essential step toward this goal was achieved during 1953-55, when, according to a group of officials of the Ministry of Railroads, " ... all the basic operating units in the railroad transport were converted to business accounting,"** with the result that

* Because of the difficulty of determining a valid exchange rate, yuan have not been converted into dollars. The rate of 2.46 yuan to US $1 usually quoted is based on the yuan-sterling rate for telegraphic transfers. This rate is arbitrarily established and maintained and bears no relationship to the value of goods in international trade or to the internal price levels.

** The principle of "business accounting," or "economic accountability" (khozraschet in Russian), has been adopted by the Chinese Communists from the USSR. Essentially it means that a firm or organization must use business accounting techniques and must, within the limits of its influence, so manage its resources as to realize maximum business profits (net income) within the framework of its plan. 18/

the discipline for planning, finances, and personnel was strengthened and norms of expenditure for labor and materials were reduced considerably. 19/ In addition to its primary financial function, business accounting, as practiced by the Chinese Communist railroads, produces the considerable collateral benefit of enabling the authorities to carry the concept of accountability down to the lowest unit and to monitor the work of each worker. Being found accountable for some loss or failure may result in a long term with a forced labor gang for "sabotage of the state economic effort" or "damage to the people's property."

In order to achieve this personal accountability, workers are, when possible, assigned exclusively to special units of equipment so that if any signs of neglect or abuse develop in that equipment, the authorities know whom to blame. For example, each locomotive has a triple crew of 9 men (3 for each shift) permanently assigned to it to do running repairs and cleaning as well as operating. 20/ A highly qualified observer reported that in spite of this unusual arrangement, or because of it, the locomotives appeared to be in excellent condition, and on no occasion did he hear a locomotive knocking or leaking steam. 21/ Similarly, train attendants are assigned for long periods to specific cars, and repair crews are assigned to a specific group of locomotives. 22/ Continuing goals are the strengthening of responsibility 23/ and the defining of responsibility. 24/ To a great extent the Chinese Communists have established a system in which blame can be assigned for every failure and the responsible persons punished.

The harassed worker, of course, cannot turn to his labor union to bring relief from these pressures. In Communist China the unions are controlled completely by the Party, and one of their chief functions, in the words of an official of the Ministry of Railroads, is to facilitate the extensive dissemination of advanced work methods. 25/ Thus with a vast quantity of labor of good quality, led and driven to sustained maximum effort, the Chinese Communists are able to achieve a very high level of utilization of their equipment in all phases of railroading.

C. New Equipment.

The performance of the railroad system of Communist China has been enhanced also by the rapid introduction of new equipment. The Chief of the Planning Administration, writing in mid-1957, summarized the situation as follows:

> During the 5-year period [1953-57], 1,311.2 kilometers of second track [double-tracking] will have been built, 644 kilometers will have been equipped with

automatic block signaling, and 15 terminals and more important classification yards will have been expanded and reconstructed. Over the 5-year period the steam locomotive park will have been increased by 683 units, the freight car park will have been augmented by 32,317 cars, and the passenger car park by 3,760. 26/

Table 1 indicates the improvement in the condition of the rails during the period of the First Five Year Plan but does not show the great improvements that have been made in general maintenance and upkeep of the roadbed.

Table 1

Condition of Rails at the Beginning and the End of the First Five Year Plan in Communist China a/
1 January 1953 and 1 January 1958

Percent

	1 January 1953	1 January 1958
	By Age	
Produced before 1920	30	16
Produced during 1920-50	65	48
Produced after 1950	5	36
Total	100	100
	By Weight per Linear Meter	
Less than 38 kilograms	32	15
38 to 42 kilograms	40	42
More than 42 kilograms	28	43
Total	100	100

a. 27/

III. Freight Cars.

A. Freight Car Park.

1. Inventory.

The flow of statistics recently released on the Chinese Communist railroads provides little information that is of value in developing a firm estimate of the size of the freight car park. Such information as has been given often appears to be contradictory.

The Chief of the Administration of the Car Economy, Lin Ts'e-an, stated that in 8 years (probably 1 October 1949 to 1 October 1957) the freight car park was increased by 49.9 percent. 28/ In another article the Chief of the Planning Administration of the Ministry of Railroads, Ma Tse-ch'ing, said that over the 5-year period (1953-57) the freight car park would have a net increase of 32,317 cars. 29/ Because several thousand cars had been added during 1949-52, a conservative estimate of the cars added in the 8-year period would be 36,000 cars. Dividing 36,000 by 49.9 percent gives approximately 72,000 as the car park in late 1949, and adding 36,000 cars to this number gives 108,000 cars as the inventory at the end of 1957.

An element of uncertainty is introduced by a statement of the Minister of Railroads that during the First Five Year Plan the manufacturing plants produced 27,600 freight cars, 1,700 passenger coaches, 3,000 crude oil tank cars, and 2,200 hopper cars. 30/ The implied distinction between "freight cars" on the one hand and "tank cars" and "hopper cars" on the other leaves open the question as to whether other statements about "freight cars" exclude tank cars and hopper cars.

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[redacted]

The question of the total inventory of freight cars can be approached also from the number of cars which would be required to

maintain the known level of traffic. In order to originate 246.05 million tons* in cars loaded to 33.8 tons,** the Chinese had to average 19,890 carloadings a day in 1956.*** With each car averaging 4 days between loadings,**** 79,560 cars would be needed. Adding 1.5 percent for cars in bad order 34/ increases the total inventory to 80,753 cars. The figure of 80,000, therefore, is accepted at the most reasonable estimate for the car park at the end of 1956.

2. Characteristics.

The freight car park in Communist China is composed of relatively new cars, more than one-third of which are less than 5 years old and very few of which are more than 20 years old. This situation is, of course, the result of intermittent warfare over most of the past two decades. Any car that existed in 1937 has had to survive the Sino-Japanese War; the Chinese civil war; and, perhaps, the Korean War, in addition to the normal wear and hazards of railroad service. Since 1953 the Chinese Communists have been building 50-ton cars, and in 1956 they turned to a 60-ton standard for gondolas and flatcars. 36/ By the end of 1956, according to the Chief of the Administration of the Car Economy, the proportion of freight cars with a capacity of 50 tons or more was 24.3 percent, "20 times more than in 1950." 37/ The same authority also has provided a table giving, in detail hitherto not available, a description of certain major types of Chinese freight cars.†

The Chinese Communists still have not given a figure for the average capacity of freight cars, but analysis of information presently available indicates that the average capacity in mid-1956 was 36.73 tons and in mid-1957, 37.28 tons.††

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* See Table 4, p. 21, below.

** See Table 5, p. 22, below.

*** The Chinese Communists have stated that in 1956 they loaded 20,000 4-axle cars per day 33/ and that the highest monthly average in that year was 21,024 cars per day. 34/

**** See p. 11, below.

† See Appendix A, Table 3, p. 20, below.

†† The derivation of these figures is discussed in Appendix C, and a listing of estimated average capacities for the mid-year points during 1950-57 appears in Appendix A, Table 5, p. 22, below.

B. Operations.

1. Average Loading per Loaded Car.

The Chinese Communist authorities have published figures on the average loading per loaded car for most of the years since 1949. The published figure for 1956 and the preliminary estimate for 1957 are 33.8 tons and 34.3 tons, respectively.* The figure for 1956 is estimated to be about 92 percent of the average capacity. The Communists have specifically announced that they were loading to 92 percent of capacity in 1957. 38/

By the standards of railroads operating in free economies, an average loading of 92 percent of capacity seems almost unbelievable. In Communist China, however, the pressures for maximum loading are tremendous, and labor is very cheap. Many special techniques of loading are practiced, some of them too labor-consuming for use in many other parts of the world. For example, machinery is partly disassembled before loading and reassembled after unloading. 39/ In the case of 10-row agricultural seeders, this procedure allows 60 machines to be loaded in a gondola that formerly carried 10. 40/ This practice is universal, but in a country where cars are scarce and labor is very cheap, it can be carried much further. The same cheap labor makes possible such practices as loading about 27 tons of heavy material (for example, iron or stone) on the bottom of a 30-ton car and using the remaining volumetric and weight capacity to load 3 tons of bamboo, rattan ware, or other goods of low weight-to-volume ratio. Timber formerly loaded to a depth of only 2.4 meters (7.87 feet) above the floor of a gondola is now loaded to a depth of 3.5 meters (11.48 feet). 41/

Another factor favoring heavy loading is the fact that such a large percentage of the goods carried consists of materials that load to 100 percent of capacity. About one-third of the tonnage originated is coal** 42/; nearly 9 percent is grain; more than 11 percent consists of railroad supplies (rails, ballast, ties, and the like) 43/; and another substantial percentage is composed of various ores, heavy steel products (pipe, beams, plates, and the like), chemicals (including salt), cement, and other heavy loading goods. Altogether, such materials must constitute more than two-thirds of the freight carried by the Chinese Communist railroads.

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* The figures announced for 1950-57 appear in Appendix A, Table 5, p. 22, below.

** In 1955 the railroads carried 69.7 million tons of coal, which was 36 percent of the total tons originated. Grain accounted for approximately 9 percent more. For the derivation of these figures, see Appendix C.

Another practice which causes actual loads to approach rated capacity is that of customarily loading some cars to 110 percent of capacity, especially at the transloading stations where the Chinese Communist railroads connect with the Soviet system. In this service, 1 Chinese 30-ton car, selected for its sturdiness and specially marked, is used to take the cargo of 2 Soviet cars carrying 16.5 tons each. 44/ In 1956 the use of 4-tier cars for hauling sheep was instituted -- an innovation which made it possible to increase the weight of sheep per car 90.49 percent over the old 2-tier method. 45/

With more than two-thirds of the cars regularly loaded to 100 percent of rated capacity, some others regularly loaded to 110 percent of rated capacity, and the remainder packed as fully and heavily as human ingenuity and lavish use of labor can achieve (often more than 100 percent of capacity), the announced average loading to 92 percent of capacity is not implausible.

2. Turnaround Time.*

The turnaround time announced by the Chinese Communists for 1956 was 2.99 days. 47/ Because this figure is 25 percent lower than that obtained by applying the methods used in the US to the statistics available on Chinese Communist railroad operations, it appears that the methods used to compute turnaround time are different even though the definitions published by the Chinese read exactly like the definition accepted in the US.**

A possible explanation of the discrepancy of 1 day lies in the concept of "reserve cars," a term which is not common in US parlance and which is used but not defined by the Chinese. Just when the Chinese Communist statisticians remove a railroad car from the operating park and put it in the reserve park is not known. It may be whenever a car is not specifically assigned to a known user -- that is, neither loaded nor on its way to be loaded -- or it may even be most or all of the time that a car is empty. In any case, the heavy pressure on the lower echelons to reduce turnaround time to a minimum would certainly lead to putting a car "in reserve" whenever such action could be justified.

* Turnaround time, as a measure of rail efficiency, is defined in the US as the average time which elapses between one loading of a freight car and the next loading.

** Nothing in the new information warrants a change from the previous estimate of 4 days for turnaround time developed in source 46/.

Turnaround time, even if measured in the accepted manner, would still be remarkably low. Recent information from Communist China sheds considerable light on how the Chinese have achieved such results.

Chuang Lin, Chief of the Administration of Freight Operations, wrote that in 8 years (presumably 1 October 1949 to 1 October 1957) the stopover time for cars at classifications yards had been reduced from more than 4 hours to 3.3 hours and that the layover time for "one freight operation," at either the loading or the unloading terminal, has been reduced from more than 13 hours to 11.3 hours. 48/

Available evidence tends to support the figure of 24.7 kilometers (km) per hour as the average terminal-to-terminal speed of a freight train in 1956.* Technical speed was increased from 31.3 km per hour in 1950 49/ to 37.5 km in 1956. 50/

Significant strides have been made in the inspection and spot repair of freight cars. High-speed repair without uncoupling the cars is achieved in many cases which formerly required breaking up a train and setting a car aside. Standardized methods, prerepaired replacement parts, and rigid time norms are used to speed operations. The Chief of the Administration of the Car Economy has stated that the new system of inspection and repair has had a favorable effect on increasing labor productivity. He has cited as examples the time required to check automatic brakes, formerly 17.1 hours, and axle boxes, formerly 9.6 hours -- operations which are now completed in 30 minutes.** 51/

The Chief of the Technical Administration has offered another illustration of the advances achieved on the railroads. Authorities have determined the most efficient methods for performing 50 different repair operations. When repairs are necessary, these methods are used on all sections, resulting in considerable technical and economic improvement. For example, to replace a pair of wheels, it was necessary formerly to uncouple the car and set it aside with a loss of several hours. Now, with improved tools and equipment, a pair of wheels can be replaced in 14 to 27 minutes without altering the makeup of the train. The new method has reduced not only the time spent in changing a pair of wheels but also switching operations and idle time for cars. 52/

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* The derivation of the figure is discussed in Appendix C. The analysis of the figure also provides support for the concept of Chinese Communist "turnaround time" as "loaded car turnover time."

** The impressiveness of this great reduction in time is somewhat diminished by the fact that the cited base times for these operations (17.1 and 9.6 hours) were extraordinarily long.

In Communist China the proportion of cars in bad order has been reduced from 3.6 percent in 1950 to 1.5 percent in 1956. 53/ The best recent US record for cars in bad order was 2.4 percent (achieved under wartime pressure in 1943) 54/; therefore, the figure of 1.5 percent for China appears almost too low. The percentage may have been achieved in part by a tendency to consider cars to be operable long after US practice would have relegated them to the bad order lists. The pressure for maximum utilization of the car park in the US in 1943 was similar to that in Communist China today, but the situation with regard to the labor supply is reversed: China has no shortage of manpower for repair work.

Perhaps the biggest single element in maintaining a low turnaround time has been the introduction of long-haul through trains and trains that operate as long-haul through trains for all but an initial section of limited length. The Minister of Railroads has stated that although the practice of long-haul through shipments began on the Ch'ang-ch'un Railroad in 1950 and was made nationwide in 1952, only 12.7 percent of the freight was moved by that method in 1953. 55/ Since 1953 there have been the following developments: the Ministry gave the railroads yearly assignments of through shipments, special facilitating regulations were made, and honorary awards and monetary bonuses were provided for those meeting or surpassing their quotas. As a result, in 1956 long-haul through freight trains carried 22 percent of the freight. 56/

The Ministry of Railroads is promoting the practice of shipping in containers as a means of facilitating loading and unloading and speeding the turnaround of cars. The containers referred to are "a specific type of large steel container, lockable and weatherproof, made to fit flatcars and to carry a diversity of small packaged goods." 57/ This practice, begun in 1955, is increasing rapidly. 58/ For the next few years the limited number of flatcars in the park will prevent any appreciable absolute increases in the practice.

All in all, the management of freight cars in Communist China reveals efficient use of equipment made possible by rhythmic planning and lavish use of hard-working manpower. The cars rarely wait for the men, whether for loading, unloading, inspection, classification, or spot repair. If necessary, the men wait for the cars.

IV. Locomotives.

A. Park.

In 1949 the Chinese Communists took possession of a locomotive park that included 100 different models built at more than 30 different

plants in 8 countries. Only 67 percent of these locomotives were operable. 59/ The Chinese authorities adopted effective measures to rehabilitate the locomotive park. In 1953, locomotives were reallocated throughout the system, so that each line had only 6 to 8 models and no terminal was responsible for more than 4 models. 60/ This practice made the stocking of parts and the assignment of specialized technicians much simpler.

The Chinese Communists have published no figures regarding the size of their locomotive park. Various estimates have been made on the basis of the scattered and conflicting evidence. A recent study produced a tentative estimate of 3,684 locomotives as of the end of 1956. Accepting this figure and deducting 9 percent for those in bad order* gives 3,352 locomotives for the operative park.

B. Operations.

During 1952-56 the productivity per worker in the "locomotive economy" of Communist China increased 88.5 percent. 61/ This increase was achieved not only by incentives but also by training personnel and by introducing more efficient methods. Some excerpts from an article by the Chief of the Administration of the Locomotive Economy illustrate these methods:

> Socialist competition has ... played a major role in improving the technical condition of the locomotive park and in raising the effectiveness of locomotive utilization ... . The wages of railroad men in the main were brought in line with the principle of remuneration according to work. By the end of 1956, 61.4 percent of the locomotive crews and 67 percent of the repair men were on a piecework basis, and a system of bonuses had been introduced ... . At the request of locomotive crews the lack of personal accountability for locomotive operation that was prevalent on the railroads of old China was abolished at the very beginning of 1949 ... . This made it possible for engineers, assistants, and firemen to manifest a full sense of responsibility 62/

By 1956 the average daily run of locomotives, excluding peddler trains, had risen to 381.5 km from the 336.7 km of 1950. 63/ By mid-1957 the average daily gross ton-kilometers performed by a locomotive was 550,000. 64/ The "daily locomotive productivity" in 1957, according to the Chinese Communists, was 2.5 to 3 times that achieved by the

* See p. 15, below.

Japanese in Manchuria and 3 to 4 times that achieved previously in China proper.* 65/

In 1956 the average locomotive was running 105,790 km between intervals for repair of running gear, 192,587 km between those for intermediate repairs, and 469,248 km between capital repairs, 66/ and the percentage of locomotives in bad order was reduced from 32.8 in 1950 to 9 in 1956. 67/

As shown in Table 2,** about 711 trains originated daily in 1956. Because the average loaded train was 1,519.1 gross tons 68/ and the average number of loaded kilometers per locomotive per day was 363.2,*** the daily gross ton-kilometrage per locomotive in 1956 was 551,737. The announced daily ton-kilometrage per locomotive for 1956, however, was 525,000. 70/ The computed figure is 5 percent higher. This discrepancy can be accounted for by the assumption that 5 percent of the locomotive movement is double-heading.

Then, if 711 trains are originated per day, 747 locomotives are required to move them, with 36 of them double-heading. From this statistic the daily requirements of road freight locomotives can be computed as a little over 1,000.****

Even though the Chinese Communists have been able to achieve intensive use of locomotives, this number seems too small, particularly in relation to a locomotive park of 3,684 units. It is not believed that the number of locomotives for switching and passenger service plus the number in bad order can account for the remainder of the park. The figures of 363.2 km and 525,000 tkm per locomotive day may be inflated by the use of a "reserve" category, as is done apparently with freight cars. In other words, these figures may represent more nearly the kilometrage and ton-kilometrage for 24 hours of actual work per locomotive. Idle locomotives may be relegated to the "reserve" for statistical purposes. In this case, the figures for average daily kilometrage and ton-kilometrage for all operable locomotives would be considerably lower than the given figures, and the daily requirement for locomotives would be correspondingly higher.

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* The term China proper refers to all parts of Communist China except the Northeast region (formerly Manchuria).

** P. 17, below.

*** 69/. This lower figure includes peddler service.

**** See Appendix C.

V. Train Operations.

A. Density.

The average density of traffic on the Chinese Communist railroads has increased from 2.4 million net tkm per kilometer in 1952 71/ to 4.6 million net tkm in 1957.* 72/ The percentage of lines carrying 5 million or more ton-kilometers per kilometer had risen from 17.5 to 40.9 in this same period. 75/ In 1956 the Peking-Mukden line, 850 km long, reportedly had a traffic density of 35 million tkm per kilometer, 76/ or about 15 percent of the total traffic for the country.

B. Load per Train.

In Chinese Communist railroading, the campaign stressed most energetically has been one for heavier trains. As a result, the average gross trailing load per train has risen from 1,015.7 tons in 1950 to 1,519.1 tons in 1956. 77/ A number of factors have combined to make this possible. Heavier loading of cars has helped because it results in less drag than does the addition of extra cars for the extra freight. Locomotive power has been increased by adding new locomotives and by improving old ones.** The biggest part of the increase, however, probably is caused by the increased skill and effort of the locomotives crews.

Until "labor hero" Cheng Hsi-k'un drove the first above-norm train in 1951, 78/ the norm apparently was considered to be a sort of ceiling that could be reached but not exceeded. The renown gained by Cheng stimulated the other engineers -- with skillful prompting by the Communist organizers, of course -- and in 1952 a concerted effort for above-norm operations began throughout the network. According to the Chief of the Administration of the Locomotive Economy, this competition had a very beneficial effect on the over-all work of railroad transport. 79/ On the 6 main lines*** this movement has resulted in achieving an average gross load of more than 2,500 tons, two-thirds more than the national average. 80/

C. Makeup of the Average Train.

Some of the data recently released in Communist China make it possible for the first time to derive some rather firm estimates of the makeup of the average train as of 1956, as shown in Table 2.****

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* In 1956 the corresponding figures for the US and the USSR were 3 million 73/ and 8.9 million, 74/ respectively.

** Achievements in locomotive operations are discussed in IV, above.

*** Peking-Hankow, Peking - Shan-hai-kuan, Shan-hai-kuan - Mukden, Harbin-Dairen, Tientsin - Pu-kow, and Shanghai-Nanking.

**** Table 2 follows on p. 17.

Table 2

Characteristics of the Average Freight Train
in Communist China a/
1956

Characteristic	Performance
Gross metric tons per train	1,519.1 b/
Net metric tons per train	945
Ratio of gross metric tons to net metric tons	1.6 to 1
Average load per loaded car (metric tons)	33.8 b/
Average capacity per car (metric tons)	36.7
Percent of capacity loaded	92
Average tare (metric tons) c/	15.4
Average number of cars per train	37.28
Average number of loaded cars per train	27.96
Average number of trains originating per day	711

a. For derivation of these estimates, see Appendix C.
b. Officially announced figure.
c. Weight of the empty car.

APPENDIX A

STATISTICAL TABLES

Table 3

Comparison of Characteristics of Old and New Types of Railroad Freight Cars in Communist China a/

Technical Characteristics	Boxcars		Gondolas		Flatcars	
	Old Type	New Type	Old Type	New Type	Old Type	New Type
Number of axles	4	4	4	4	4	4
Carrying capacity (metric tons)	30	50	30	60	30	60
Tare weight of car (metric tons)	16.5	21.6	15.0	20.8	13.0	21.0
Length of car frame (meters)	9.83	13.10	10.37	12.58	10.32	12.50
Length between coupling axes of automatic couplers (meters)	10.76	14.03	11.30	13.49	11.30	13.41
Volume of body (cubic meters)	63.0	100.0	36.0	68.0		
Coefficient of tare divided by capacity	0.550	0.432	0.500	0.347	0.433	0.350
Load on rails per pair of wheels (metric tons)	11.6	17.9	11.2	20.2	10.8	20.2
Load per running meter of track (metric tons per meter)	4.33	5.12	3.99	6.00	3.81	6.04
Relative body volume (cubic meters per ton)	2.10	2.00	1.20	1.15		
Ratio of tare weight to body volume (metric tons per cubic meter)	0.262	0.216	0.416	0.303		

a. 81/

Table 4

Rail Freight Traffic in Communist China
1950-57

Year	Amount (Million Metric Tons Originated)	Volume (Billion Metric Ton-Kilometers)	Density (Million Net Ton-Kilometers per Kilometer)
1950	99.5 a/	39.4 a/	N.A.
1951	110.5 a/	51.5 a/	N.A.
1952	132.1 a/	60.2 a/	2.4 b/
1953	160.4 a/	78.1 a/	2.6 c/
1954	192.6 a/	93.2 a/	N.A.
1955	193.4 a/	98.1 a/	3.7 d/
1956	246.0 a/	120.4 a/	4.5 e/
1957	270.0 f/	134.6 g/	4.6 h/

a. 82/
b. 83/
c. Seventy-four percent above the figure for 1953. 84/
d. 85/
e. 86/
f. Preliminary figures. 87/
g. The figure is 111.8 percent of the figure for 1956. 88/
h. The figure was announced before the year ended and, obviously, is a preliminary figure although the announcement did not so specify. 89/

Table 5

Statistics on Carloading and Gross Weight of Freight Trains in Communist China
1950-57

Year	Average Load per Car (Metric Tons)	Average Capacity per Car a/ (Metric Tons)	Ratio of Loading to Capacity b/ (Percent)	Amount Loaded per Day c/ (Metric Tons)	Cars Loaded per Day d/	Average Gross Weight per Freight Train e/ (Metric Tons)
1950	26.6 f/	31.92	83.3	273,330	10,276	1,015.7 g/
1951	N.A.	31.87	N.A.	302,740	N.A.	N.A.
1952	28.9 h/	32.10	90.0	360,830	12,485	1,084.5 i/
1953	29.9 j/	32.99	90.1	439,553	14,701	1,262.7 k/
1954	31.4 l/	34.17	91.9	527,679	16,805	N.A.
1955	32.4 m/	35.50	91.3	529,852	16,353	1,392.6 n/
1956	33.8 o/	36.73	92.0	672,264	19,890	1,519.1 p/
1957	34.3 q/	37.28 r/	92.0 s/	739,726	21,566	N.A.

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[redacted]

b. First column divided by second column.
c. Tons originated per year (from Table 2) divided by 365 or 366, as appropriate.
d. Fourth column divided by first column.
e. Excluding locomotive and tender.

Table 5

Statistics on Carloading and Gross Weight of Freight Trains in Communist China
1950-57
(Continued)

f. 90/
g. 91/
h. 92/
i. 93/
j. 94/
k. 95/
l. Five percent above the figure for 1953. 96/
m. 97/
n. One hundred and twenty six and one-half tons less than for 1956. 98/
o. 99/
p. 100/
q. 101/
r. Computed from the average load per car and the car-loading ratio for 1957 (34.3 divided by 92 percent).
s. 102/

Approved For Release 1999/09/27 : CIA-RDP79S01046A000600030001-2

APPENDIX B

COMMENTS ON STATISTICS ON RAILROADS
AS REPORTED BY THE CHINESE COMMUNISTS

As stated in the introduction to this research aid, statistics on Chinese Communist railroads are generally accurate and reliable. The figures are not deliberately fraudulent and are intended to mean what they say. Even so, the Chinese Communists are very careless in publishing their statistics. In several articles on the railroads appearing in Chinese, Soviet, and East German periodicals during the latter half of 1957, numerous inconsistencies and inaccuracies occur. These errors are as likely to minimize an achievement as to exaggerate it. For example, in the issue of Zheleznodorozhnyy transport for October 1957, an article on "The Locomotive Economy," both in the text and in a table, gives the rate of fuel consumption as 250 kilograms (of standard fuel) per 10,000 (gross) ton-kilometers for 1950 and 151.6 kilograms for 1956. These figures are confirmed by other sources. 103/ Just a few pages away, the article on "Advanced Work Methods" states that between 1950 and 1956 fuel consumption was cut 48.4 kilograms, or nearly 20 percent. Actually, 250 minus 151.6 leaves 98.4 kilograms, or about 40 percent. Someone apparently misread 98.4 as 48.4 and then computed the percentage from this incorrect figure.

Likewise in this series an article by T'eng Tai-yuan, Minister of Railroads, states that freight turnover (ton-kilometers) in 1956 was more than three times that of 1950, which is correct. A few pages away, the Chief of the Planning Administration writes that freight turnover in 1957 will be four times that of 1950 "as a result of fulfillment of the First Five Year Plan." Neither the planned nor the actual performance for 1957 is sufficiently higher than that of 1956 to change the figure from more than 3 times to 4 times, which would be 156 billion tkm.

The average gross weight per train is given twice in this series of articles as 1,519.1 tons. One of these appearances is in T'eng Tai-yuan's article. This figure probably is the latest and most accurate, but early in January 1957 there appeared a figure of 1,513.1 tons for 1956. Because this figure was announced so soon after the end of the year, doubtless it was a preliminary figure, subject to revision after sufficient time had passed to permit a more thorough compilation and analysis of statistics for 1956. Many figures announced early are altered by mid-year. Yet T'eng himself, in an article in the November issue of the Soviet magazine Elektricheskaya i teplovoznaya tyaga repeats the figure of 1,513.1. 104/ The newspaper Jen-min Jih-pao,

in the issue for 15 November 1957, rounds the figure to 1,513. 105/ Adding to the confusion is another statement in Jen-min Jih-pao of 20 September 1957 that "in 1956 the loads hauled by all the locomotives averaged 1,485 metric tons." 106/ Ruling out the last figure, which appears only once, the difference between the figures commonly cited, 1,513.1 and 1,519.1, is less than 0.4 percent and does not seriously affect the computations based on the figures for gross tonnage.

Probably the most startling inconsistency in the statistics occurred in an article by T'eng Tai-yuan in the issue of Deutsche Eisenbahn Technik* for December 1957. There he speaks of 363.2 km as the average daily kilometrage per locomotive and 243.1 km as the average daily kilometrage per freight train locomotive. 107/ This latter figure has appeared nowhere else, and what it means is not at all clear. On its face the statement would appear to mean that the average daily kilometrage for freight and passenger locomotives combined is 363.2; for freight locomotives alone, 243.1 km; and for passenger locomotives, a figure which is unspecified but would have to be near 500 km to bring an unweighted average up to 363.2 km. Understood this way, however, the figure of 243.1 km does not agree with the other figures for freight locomotives given on the same page of the article -- 1,513.1 gross tons per average train and 580,200 tkm average haulage per day per locomotive. Furthermore, in an issue of Jen-min Jih-pao on 15 November 1957, the figure of 363.2 km is labeled specifically "average daily kilometrage for freight locomotives." 108/ The figure of 243.1 km would appear to be either a flagrant error or a figure with some different meaning from that which it seems to have.

Another example of faulty statistics appears in discussions of the savings made in 1955 above 1954 in shortening the average length of haul for coal. The series of articles in Zheleznodorozhnyy transport 109/ states that the average haul for coal was reduced 14.2 km, a fact which saved 990 million tkm of transportation. These figures would mean that 69.7 million tons of coal originated by rail in 1955. Several months earlier a Chinese periodical stated that in 1955 a reduction of 6.5 km in the average haul of coal resulted in a saving of transportation amounting to 450 million tkm. 110/ This statement indicates that 69.2 million tons of coal originated in 1955. Another Chinese Communist periodical, published in October 1957, states that the length of haul was shortened 6.5 km with a saving of 400 million tkm. 111/ These figures mean that 61.5 million tons of coal were hauled. In the latter two instances the figures of 450 million tkm and 400 million tkm may be merely different degrees of rounding the same original figure -- for example, 435 million tkm.

* Of all the recent articles analyzed, this one by T'eng Tai-yuan seems to have the greatest number of discrepancies and possible errors.

Careful analysis of available data made it possible to resolve another apparent inconsistency. In two of the articles in Zheleznodorozhnyy transport, including the one by T'eng Tai-yuan, the average daily kilometrage per locomotive is given as 381.5 for 1956. 112/ In his article in Elektricheskaya i teplovoznaya tyaga, 113/ T'eng gives 363.2 km, and in another recent article the figure appears, with the decimal rounded off, as 363 km. 114/

Further interpretation of items apparently separate made it possible to construct a series of links between items apparently separate which indicated that the higher figure (381.5 km) referred to the average for locomotives excluding those in peddler service. Both figures, then, presumably are correct, but the difficulty lay in the fact that, in each case, they appeared without adequate definition or qualification. Many other apparent discrepancies might be open to resolution if sufficient information on the exact meanings were available.

APPENDIX C

METHODOLOGY

1. Terminal-to-Terminal Speed of Freight Cars.

The Chinese Communists have not recently published a figure for terminal-to-terminal speed, but they have provided two statements from which two very similar figures for terminal-to-terminal speed may be derived. They announced that cars were in motion 30 percent of the turnaround period. 115/ Thirty percent of 2.99 days is 21.3 hours. Dividing this figure into the average length of haul (489 km -- ton-kilometers divided by tons originated) gives 22.7 km per hour (kph),* which is a reasonable figure. An equally reasonable figure can be derived from the statement that (in 1956) a refrigerator train made the run from Canton to Peking, 3,310 km via Shanghai, "in 114 hours, 20 hours less than an ordinary freight on the same run." 116/ Dividing 134 hours into 3,310 km gives 24.7 kph. This rate seems like a reasonable improvement in 5 years over the announced rate of 22.4 kph in 1951. 117/ For this reason, the figure of 24.7 is preferred over that of 22.7 developed previously.

The stated saving in 1956 of 7 million car hours by carrying 22 percent of the freight in long-haul through trains 118/ indicates a saving of 797 cars of the 19,890 cars loaded per day. The cars thus saved would permit about 4 percent more daily carloadings from the existing car park, or, in other words, the turnaround time as normally defined was reduced about 4 percent. This 4-percent reduction was achieved by the increased speed of 22 percent of loaded movement, or 16.5 percent of all car movement. Thus the through trains must have moved at a speed 24.2 percent (4 percent divided by 16.5 percent) faster than the average speed of other cars, loaded or empty. If the figure of 24.7 kph is assumed to be the speed for through trains, then the cars on non-through trains must have averaged 19.9 kph (24.7 percent divided by 124.2 percent). In that case, a loaded car on a through train took

* The development of 22.7, however, does add to the evidence that the 2.99 days "turnaround time" may mean "loaded car turnover time." If 30 percent of the turnaround time is moving time -- that is, 21.53 hours -- and this number is divided into 650 km (489 loaded movement and 161 empty movement), the result is a speed of 30.19 kph for the average freight train. This rate is faster than the boasted speed of the special refrigerator train discussed below (3,310 km divided by 114 hours equals 29.04 kph).

19.8 hours to cover the over-all average length of haul of 489 km while ordinary loaded cars took 24.6 hours to cover the same distance. Ordinary loaded cars, therefore, must lose 4.8 hours in classification operations. Because the average stopover time for a car at classification stations is 3.3 hours, 119/ the average loaded car in ordinary trains must be classified approximately 1.5 times between terminals on the average length of haul.

These figures probably are somewhat skewed by the fact that through trains are referred to as long-haul through trains, implying that they run longer than the average length of haul and therefore may account for more than 22 percent of loaded car movement.

2. Net Load per Train.

In order to determine the net load per average train in 1956, it is necessary to assume that the proportion of loaded cars to empties is 3 to 1, as is implied by the study of turnaround time.

Average capacity per car is estimated to have been 36.7 tons. This capacity was derived by dividing the average load (33.8 tons) by 92 percent (the percent of capacity to which cars were loaded in 1957). 120/ This same percentage is used for 1956 because an estimate derived independently (see 3, below) based on a number of assumptions gave 93 percent for 1956. Because a decrease in percentage is unlikely in 1957, 92 percent is taken as a reasonable estimate for 1956. The actual figure, which has never been published, may be a few tenths of a percent below 92 percent.

In 1956 the coefficient of tare (tare divided by rated capacity) was 0.42. 121/ Taking 0.42 times 36.7 tons (average capacity) gives 15.4 as the average tare. Adding the average tare to the average load (15.4 plus 33.8) gives 49.2 tons as the average gross weight per loaded car. Assuming a 3 to 1 ratio of loaded cars to empties, the gross weight of loaded cars is then multiplied by 3 to weight it, giving 147.6. To this figure is added the tare weight of an average empty car weighted by 1 (147.6 plus 15.4), giving 163.0 tons. Dividing the average gross weight per train (1,519.1 tons) by 163.0 gives 9.32 as one-fourth of the cars per average train (one-fourth, because 163.0 tons is the weight of 4 cars: 3 loaded and 1 empty).

Three times 9.32 gives 27.96 as the average number of loaded cars per train, with, of course, 9.32 as the average number of empties. The average train is thus 37.28 cars long.

Figuring 27.96 cars with an average load of 33.8 tons per car gives 945 tons as the average net load per train. Thus the total tare,

including empties, is 574.1 tons, and the ratio of gross tons to net tons on the average train is 1.6 to 1 (1,519.1 divided by 945).

In the discussion of average capacity per car as derived from known car characteristics and incomplete data regarding the breakdown of the park into types, it was estimated that the average tare in 1956 was 16.95 tons.* This figure along with the given 33.8 net tons per average loaded car, when used in the series of calculations developed just above, gives 50.75 gross tons per loaded car, 910.4 net tons per train, and a gross-to-net ratio of 1.67 to 1.

Other evidence, however, tends to support the lower, 1.6 to 1, ratio. For example, a Japanese who headed the Hsuchow Railroad office sometime during World War II used a 1.5 to 1 ratio in his calculations, the ratio being derived by dividing the total weight of cars (loaded or empty) by 30 tons. 122/ The derivation of the figure of 30 tons is not clear; however, it may represent rated capacity rather than average load.

3. Average Capacity per Car.

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25X1XHk The problems of average capacity per car and of average ratio of gross weight to net weight per loaded car were analyzed with a completely independent set of data. [redacted] the car park as of April 1953 consisted of 45 percent boxcars, 48 percent gondolas, 5 percent flatcars, and 2 percent tank cars. 123/ Assuming that the same proportions held in 1956 and omitting the 2 percent for tank cars, these percentages can be divided into 30-ton cars and 50-ton-or-over cars by applying the 24.3 figure given by the Chinese Communists as the percentage of cars 50 tons or over in the park in 1956. 124/ This process yields the following tabulation:

	Percent of Total Car Park	
	Capacity of Less Than 50 Metric Tons	Capacity of 50 Metric Tons or More
Boxcars	34.06	10.94
Gondolas	36.24	11.66
Flatcars	3.78	1.22

A tabulation showing the characteristics of freight cars as stated by the Communists and giving the capacities and tare of the old type and new type of freight cars in tons, follows:

* See p. 32, below.

	Old Type		New Type	
	Capacity	Tare	Capacity	Tare
Boxcars	30	16.5	50	21.6
Gondolas	30	15.0	60	20.8
Flatcars	30	13.0	60	21.0

If the figures for capacity in this tabulation are applied to the percentages in the preceding tabulation (adjusted to 100 percent), the average capacity per car is 36.17 tons. Similar analysis of the figures for tare gives an average tare of 16.95. Thus the average gross weight is 53.12 tons per fully loaded car and 50.75 per average loaded car. The theoretical coefficient of tare (tare divided by capacity) is 0.469, and the ratio of gross weight to net weight on an average loaded car is 1.501 to 1. The average ratio of loading for all loaded cars is 33.8 divided by 36.176, or 93 percent of capacity.

A computation based on the results of the study on car markings and assuming loading to be 92 percent of capacity instead of 93 percent gives 49.2 tons for the average loaded car (33.8 tons load and 15.4 tons tare). The Chinese Communists have given 0.42 as the coefficient of tare, and the ratio of gross weight to net weight for an average loaded car comes to 1.46 (49.2 divided by 33.8).

Another possible check on this ratio can be made from the statement that if 55,347,000 tons extra of freight 125/ had not been carried in above-norm trains, 50,659 additional trains would have been needed. 126/ This computation gives 1,093 tons as the average net weight per train (presumably a train with no empty cars). Dividing the net figure of 1,093 tons into the announced average gross weight of 1,519.1 tons gives 1.39 as the gross-to-net ratio. Because of the possibility that statisticians of the Ministry of Railroads may have assumed loading to average capacity rather than loading to average load, thus making the figure a ratio of gross weight to rated capacity, this concept was tested. Using the average capacity of 36.7 tons instead of the average load of 33.8 tons gives 1.42 as the ratio of gross weight to rated capacity for 1956. Thus, in either case, the calculations used above to get 1.46 as the gross-to-net ratio produced a result that is conservatively high when tested by the figures for trains saved by trains carrying above-norm loads.

4. Number of Road Freight Locomotives.

The number of road freight locomotives required daily can be computed in either of two ways:

a. 120.4 billion net tkm (1956) x 1.6 ratio of gross to net = 192.64 billion gross tkm.

$$\frac{192.64 \text{ billion}}{366 \text{ days}} = 526.39 \text{ million gross tkm per day}$$

$$\frac{526.39 \text{ million gross tkm per day}}{525{,}000 \text{ gross tkm per locomotive day}} = 1{,}003 \text{ locomotives required daily}$$

b. 747 locomotives required to initiate 711 trains daily x 489 km average length of loaded haul = 365,283 locomotive km undertaken daily

$$\frac{365.283 \text{ locomotive km}}{363.2 \text{ daily km per locomotive}} = 1{,}006 \text{ locomotives required daily}$$

The average number of freight trains in being any day also can be computed two ways:

a. $$\frac{526 \text{ million gross tkm daily}}{1{,}519.1 \text{ tons average gross weight per train}} = 346{,}258 \text{ train km daily}$$

$$\frac{489 \text{ km average length of haul}}{2.99 \text{ days loaded car turnover-time}} = 163.55 \text{ km per day}$$

$$\frac{346{,}258}{163.55} = 2{,}117.1 \text{ trains in being daily}$$

b. 711 trains originated per day x 2.99 days loaded car turnover time = 2,125.9 trains in being daily

This concept of trains in being is merely a statistical device, because at no one time is anywhere near that number of freight trains actually mobilized. Many of them have been dissolved into cars and racks of cars in the classification yards or are in the process of being broken up or assembled in these yards or being loaded or unloaded, and the like. What the figure more literally represents is trains-worth of cars in operation. It may be demonstrated by multiplying either of the figures for trains in being (developed above) by the average number of cars per train (37.28) that the results, 79,254 cars and 78,952 cars, are approximately the same as the estimated operating car park. The number of road-freight locomotives required will be much smaller than the number of trains in being as computed above.

APPENDIX D

GAPS IN INTELLIGENCE

In spite of the considerable increase in the flow of information on the Chinese Communist railroads from open sources during the past year, many important facts are still missing. Among these items are the average ratio between net and gross weight of freight trains, the average tare and capacity per car, the number of cars per average train, the total inventory of freight cars, the number of carloadings per day, and the number of trains originated per day. Available information has made it possible to attempt a computation for each of these items in this research aid, but the figures are tentative. Other important missing data are the number of locomotives used daily for freight trains, for passenger trains, and for yard work; a complete breakdown of turnaround time into its components; and a definitive explanation of what the Chinese Communists mean by "reserve" cars.

APPENDIX E

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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1. CIA. FDD Summary no 1637, 13 Jan 58, p. 19. OFF USE. Eval. RR 2.
2. CIA. FDD Translation no 698, 19 Mar 58, p. 48. OFF USE. Eval. RR 2.
3. Ibid., p. 18-19. OFF USE. Eval. RR 2.
4. Ibid., p. 15. OFF USE. Eval. RR 1.
5. Ibid., p. 77. OFF USE. Eval. RR 2.
6. CIA. FDD Summary no 1344, 24 May 57, p. 34. C. Eval. RR 3.
7. Association of American Railroads. Railroad Transportation: A Statistical Record, 1921-55, Washington, D.C., Dec 56, p. 1, 3. U. Eval. RR 2.
8. CIA. FDD Translation no 698, 19 Mar 58, p. 11. OFF USE. Eval. RR 2.
9. Ibid., p. 10-13. OFF USE. Eval. RR 2.
10. Ibid., p. 1. OFF USE. Eval. RR 3.
11. Ibid., p. 12-13. OFF USE. Eval. RR 2.
12. Ibid., p. 25. OFF USE. Eval. RR 4.
13. Ibid., p. 52. OFF USE. Eval. RR 3.

14. Ibid.
15. Ibid., p. 80. OFF USE. Eval. RR 2.
16. Ibid., p. 37. OFF USE. Eval. RR 2.
17. Ibid., p. 57. OFF USE. Eval. RR 2.
18. CIA. CIA/RR 83, Management of the Soviet Industrial Enterprise, 14 Nov 56, p. 14-15. S.

25X1C

19. CIA. FDD Translation no 698, 19 Mar 58, p. 62. OFF USE. Eval. RR 2.
20. [redacted]
21. [redacted]
22. CIA. FDD Translation no 698, 19 Mar 58, p. 20. OFF USE. Eval. RR 2.
23. Ibid.
24. Ibid., p. 56. OFF USE. Eval. RR 2.
25. Ibid., p. 62. OFF USE. Eval. RR 1.
26. Ibid., p. 78. OFF USE. Eval. RR 2.
27. Ibid., p. 40. OFF USE. Eval. RR 2.
28. Ibid., p. 30. OFF USE. Eval. RR 3.

STATSPEC

29. Ibid., p. 78. OFF USE. Eval. RR 2.
30. [redacted]
31. Ibid.

25X1A

32. [redacted]
33. CIA. FDD Summary no 1318, 3 May 57, p. 31. C. Eval. RR 2.
34. CIA. FDD Summary no 1650, 27 Jan 58, p. 22. OFF USE. Eval. RR 3.
35. CIA. FDD Translation no 698, 19 Mar 58, p. 34. OFF USE. Eval. RR 3.
36. Ibid., p. 32. OFF USE. Eval. RR 3.
37. Ibid., p. 30. OFF USE. Eval. RR 3.

25X1A

38. Ibid., p. 23. OFF USE. Eval. RR 3.
39. [redacted]
40. CIA. FDD Translation no 698, 19 Mar 58, p. 49. OFF USE. Eval. RR 3.
41. Ibid., p. 20. OFF USE. Eval. RR 2.

STATSPEC

42. [redacted]
43. CIA. FDD Summary no 1463, 3 Sep 57, p. 18. OFF USE. Eval. RR 3.
44. Jen-min T'ieh-tao, May 51. U. Eval. RR 2.
45. CIA. FDD Summary no 1262, 18 Mar 57, p. 30. C. Eval. RR 3.
46. CIA. CIA/RR 72, Railroad Transportation in Communist China, 1950-54, 28 May 56, p. 77-90. S.
47. CIA. FDD Translation no 698, 19 Mar 58, p. 4. OFF USE. Eval. RR 4.
48. Ibid., p. 22. OFF USE. Eval. RR 3.
49. Ibid., p. 27. OFF USE. Eval. RR 3.

50. CIA. FDD Summary no 1554, 8 Nov 57, p. 47. OFF USE. Eval. RR 3.
51. CIA. FDD Translation no 698, 19 Mar 58, p. 27. OFF USE. Eval. RR 2.
52. Ibid., p. 50. OFF USE. Eval. RR 3.
53. Ibid., p. 34. OFF USE. Eval. RR 3.
54. Eastern Railroad Presidents Conference. Yearbook of Railroad Information, 1957 Edition, New York, Apr 57. U. Eval. RR 2.
55. CIA. FDD Translation no 698, 19 Mar 58, p. 6. OFF USE. Eval. RR 2.
56. Ibid.
57. Ibid.
58. Ibid.
59. Ibid., p. 24. OFF USE. Eval. RR 2.
60. Ibid., p. 27. OFF USE. Eval. RR 2.
61. Zheleznodorozhnyy transport, Oct 57, p. 33, fig 4. U. Eval. RR 3.
62. CIA. FDD Translation no 698, 19 Mar 58, p. 25-26. OFF USE. Eval. RR 3.
63. Ibid., p. 27. OFF USE. Eval. RR 3.
64. CIA. FDD Summary no 1554, 8 Nov 57, p. 47. OFF USE. Eval. RR 3.
65. CIA. FDD Translation no 698, 19 Mar 58, p. 27. OFF USE. Eval. RR 3.
66. Ibid.
67. Zheleznodorozhnyy transport, Oct 57, p. 33, fig 2. U. Eval. RR 3.
68. CIA. FDD Translation no 698, 19 Mar 58, p. 4, 25. OFF USE. Eval. RR 3.

25X1A

69. CIA. FDD Summary no 1650, 27 Jan 58, p. 23. OFF USE. Eval. RR 3.
70. CIA. FDD Summary no 1554, 8 Nov 57, p. 47. OFF USE. Eval. RR 3.
71. [redacted]
72. CIA. FDD Translation no 698, 19 Mar 58, p. 77. OFF USE. Eval. RR 2.
73. Association of American Railroads. Statistical Summary no 41, Statistics of Railways of Class I, United States, Calendar Years 1946-1956, Washington D.C., Aug 57. U. Eval. RR 2.
74. UN, ECE, Transport Division. Annual Bulletin of Transport Statistics for Europe: 1956, Geneva, 1957, p. 37. U. Eval. RR 2.
75. CIA. FDD Translation no 698, 19 Mar 58, p. 77. OFF USE. Eval. RR 2.
76. Ibid., p. 39. OFF USE. Eval. RR 2.
77. Ibid., p. 4, 25. OFF USE. Eval. RR 3.
78. Ibid., p. 24. OFF USE. Eval. RR 2.
79. Ibid.
80. Ibid.
CIA. FDD Summary no 1554, 8 Nov 57, p. 42. OFF USE. Eval. RR 2.
81. CIA. FDD Translation no 698, 19 Mar 58, p. 33. OFF USE. Eval. RR 2.

82. CIA. CIA/RR 117, The Role of Transportation in the Economy of Communist China, 1950-62, 31 Dec 57, p. 6. S.

25X1AGN 83. [redacted]

84. CIA. FDD Translation no 698, 19 Mar 58, p. 77. OFF USE. Eval. RR 2.

85. CIA. FDD Summary no 1318, 3 May 57, p. 31. C. Eval. RR 2.

86. Ibid., no 1603, 23 Dec 57, p. 24. OFF USE. Eval. RR 2.

87. [redacted]

STATSPEC 88. [redacted]

89. CIA. FDD Translation no 698, 19 Mar 58, p. 77. OFF USE. Eval. RR 3.

90. Ibid., p. 4. OFF USE. Eval. RR 2.
CIA. FDD Summary no 1318, 3 May 57, p. 30. C. Eval. RR 2.
Ibid., no 1596, 16 Dec 57, p. 39. OFF USE. Eval. RR 2.

91. CIA. FDD Translation no 698, 19 Mar 58, p. 4, 25. OFF USE. Eval. RR 2.
CIA. FDD Summary no 1596, 16 Dec 57, p. 40. OFF USE. Eval. RR 2.

92. CIA. FDD Summary no 1596, 16 Dec 57, p. 39. OFF USE. Eval. RR 2.

93. Ibid., p. 40. OFF USE. Eval. RR 2.

94. CIA. FDD Translation no 698, 19 Mar 58, p. 4. OFF USE. Eval. RR 2.

STATSPEC 95. Ibid.

96. [redacted]

97. CIA. FDD Summary no 1318, 3 May 57, p. 30. C. Eval. RR 2.

25X1A 98. [redacted]

99. CIA. FDD Translation no 698, 19 Mar 58, p. 4. OFF USE. Eval. RR 2.

100. Ibid., p. 4, 25. OFF USE. Eval. RR 2.

101. CIA. FDD Summary no 1596, 16 Dec 57, p. 39. OFF USE. Eval. RR 3.

102. CIA. FDD Translation no 698, 19 Mar 58, p. 23. OFF USE. Eval. RR 2.
Deutsche Eisenbahn Technik, Dec 57, p. 539. U. Eval. RR 3.

103. CIA. CIA/RR RA-29, Coal Consumption by the Chinese Communist Railroads, 14 Apr 58. S.

104. CIA. FDD Summary no 1650, 27 Jan 58, p. 23. OFF USE. Eval. RR 3.

105. CIA. FDD Summary no 1603, 23 Dec 57, p. 22. OFF USE. Eval. RR 3.

106. CIA. FDD Summary no 1567, 25 Nov 57, p. 30. OFF USE. Eval. RR 4.

107. T'eng Tai-yuan. "The Building of the Chinese Railroads in the Last Five Years," Deutsche Eisenbahn Technik, Dec 57, p. 539. U. Eval. RR 4.

108. CIA. FDD Summary no 1603, 23 Dec 57, p. 22. OFF USE. Eval. RR 3.
109. CIA. FDD Translation no 698, 19 Mar 58, p. 18. OFF USE. Eval. RR 5.
110. CIA. FDD Summary no 1370, 18 Jun 57, p. 27. C. Eval. RR 3.
111. State. Extracts from China Mainland Magazines, no 108, 25 Nov 57, p. 31. U. Eval. RR 3.
112. CIA. FDD Translation no 698, 19 Mar 58, p. 4, 27. OFF USE. Eval. RR 3.
113. CIA. FDD Summary no 1650, 27 Jan 58, p. 23. OFF USE. Eval. RR 3.
114. CIA. FDD Summary no 1603, 23 Dec 57, p. 24. OFF USE. Eval. RR 3.
115. CIA. FDD Summary no 1463, 3 Sep 57, p. 18. OFF USE. Eval. RR 3.
116. CIA. FDD Summary no 1058, 10 Sep 56, p. 48. C. Eval. RR 3.

STATSPEC

117. [redacted]

118. CIA. FDD Translation no 698, 19 Mar 58, p. 6. OFF USE. Eval. RR 3.
119. Ibid., p. 22. OFF USE. Eval. RR 3.
120. Ibid., p. 23. OFF USE. Eval. RR 3.
Deutsche Eisenbahn Technik, Dec 57, p. 539. U. Eval. RR 3.
121. CIA. FDD Summary no 1119, 5 Nov 56, p. 42. C. Eval. RR 3.

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122.
123. [redacted]

124. CIA. FDD Translation no 698, 19 Mar 58, p. 30. OFF USE. Eval. RR 2.
125. Ibid., p. 46. OFF USE. Eval. RR 2.
126. Ibid., p. 23. OFF USE. Eval. RR 2.